

RHB RADAR SCIENCE LOG
KWAJEX
KWAJALEIN ATOLL
23 July 1999 – 15 September 1999

Local time = UTC + 12 hr

RPHASE = on

Fields collected, T, Z, VR, SW

Filters: T (log=0.8 dB), Z (log=0.8, CSR=18), VR(SQI=0.65, CSR=18), SW (SIG=5.0, SQI=0.65, CSR=18)

Current scans implemented:

Format: (RadarEchohgt_scan)

RHB6KM_A (6 km echo top heights, hybrid scan A)

Elevation angles: 0.4, 1.3, 2.1, 3.0, 3.8, 4.7, 5.6, 6.6, 7.8, 9.3, 11.1, 13.3

RHB6KM_B (6 km echo top heights, hybrid scan B)

Elevation angles: 0.4, 0.8, 1.7, 2.5, 3.4, 4.3, 5.2, 6.1, 7.2, 8.5, 10.2, 12.1

RHB8KM_A (8 km echo top heights, hybrid scan A)

Elevation angles: 0.4, 1.6, 2.7, 3.9, 5.1, 6.2, 7.4, 8.8, 10.4, 12.4, 14.8, 17.8

RHB8KM_B (8 km echo top heights, hybrid scan B)

Elevation angles: 0.4, 1.0, 2.1, 3.3, 4.5, 5.7, 6.8, 8.1, 9.6, 11.4, 13.6, 16.2

RHB10KM_A (10 km echo top heights, hybrid scan A)

Elevation angles: 0.4, 1.8, 3.3, 4.7, 6.2, 7.6, 9.1, 10.8, 12.8, 15.3, 18.2, 21.9

RHB10KM_B (10 km echo top heights, hybrid scan B)

Elevation angles: 0.4, 1.1, 2.6, 4.0, 5.4, 6.9, 8.3, 9.9, 11.7, 14.0, 16.7, 20.0

RHB13KM_A (13 km echo top heights, hybrid scan A)

Elevation angles: 0.4, 2.3, 4.2, 6.1, 8.0, 9.9, 11.8, 14.0, 16.6, 19.6, 23.2, 27.6

RHB13KM_B (13 km echo top heights, hybrid scan B)

Elevation angles: 0.4, 1.4, 3.3, 5.2, 7.1, 9.0, 10.9, 12.9, 15.2, 18.0, 21.3, 25.3

Wednesday, 28 July 1999

0030 UTC We left port in Kwajalein. We quite a send off. All of three people arrived to see us depart: Lester Atkinson, Jeff Halverson, and Ali Tokay.

Arrived on-station at ~05 UTC (08 21.613N, 167 43.753E). Passed through a nice squall on the way here – visual observations of CG's with radar showing 45-50 dB cores.

Started collecting data at 07 UTC. We are using the 13A-13B tasks as our default strategy followed by a 300 km surveillance scan and selected RHI's in the remaining time. We are implementing this in the standard "bottom-up" approach (moving upward

in elevation angle). Sounding operations will begin at 0745 UTC (09 UTC at trop) synoptic time. RC

Talked to NOAA ship KA'IMIMOANA. They have requested to deploy the western ATLAS mooring to a position ~3.5 miles NW of the nominal position. Talked to ops center – they are OK with this. We will rendezvous with the NOAA ship tomorrow to discuss the mooring deployment. RC

Ops center mentioned that the Citation will fly this evening (take off at 06 UTC) and catch the TRMM overpass at ~09:30 UTC. RC

0820 UTC Radar shows that most of the echo has dissipated at this time. All the radar scans and product output seems to be working fine at this time. PK

0855 UTC CONVAIR scheduled to arrive at $8^{\circ} 03' N$ by $168^{\circ} 10' E$ as the first point. The second point will be at $7^{\circ} 51' N$ by $168^{\circ} 47' E$. CS

Called Ops Center ~09:05 UTC. It appears that our computer's time is about 5 – 8 seconds ahead of theirs. CS

0952 UTC Adjusted the RHI scan to include approaching activity from the Southeast. The new RHI azimuth values are: 135, 138, 141.5, 144, 148. CS

1013 UTC Adjusted the RHI scan once more. Removed the 144 and 148 values, and changed the 141.5 to 141. CS

1330 UTC Radioed the Ops Center to request that the scanning strategy be changed from the 13km height to 8km in order to increase resolution. Adam Sobel at the Ops Center informed me that there were no radar operators available at Aeromet that could change the scanning strategy. Therefore, the proposition was struck down. CRA

1351 UTC Adjusting RHI scan again. This time, including only two azimuth angles: 92 and 94. Also, an enhanced area of moderate precipitation is approaching from the southeast. While some lightning was sighted between the RHB and Kwaj around 0400 UTC this afternoon, neither the Kwajex participants nor the RHB crew has seen any since. CRA

1800 UTC Paul on Duty. Some very weak echo is showing up to the NE at about 120 km. Otherwise, it looks like every else has dissipated at this time. Surface winds remain out of the SE at about 10-15 kt. The swells have been increasing throughout the night and the ship seems to rolling more and using the bow thrusters to keep into the wind. We are still the 13 km, surveillance and rhi scans from the night before. Scans have been archiving to tape with out any problems over the night. PAK

1828 UTC It is becoming light outside. Cloud observations show a broken cirrus deck in all quads with scattered towering CU to the NE.

1835 UTC We have been receiving errors in SIGMET that state:
 “DSP AZ angles exceed 30 degree span: ...” As of now, we have received about 140 error messages. We will have to look into this problem. Our current location is:
 8° 21.6003’ N
 167° 43.8002’ E
 PAK

2100 UTC The amount of echo coverage remains small. A few isolated cells exist to the NE. The radar continues to give the DSP error mentioned above. We have also noticed that the real-time display doesn’t update the time until the new task starts. Sky observations show mostly alto-cumulus with a few embedded cb’s. PAK

2215 UTC – talked to Lester on the HF radio. He has been in contact with SIGMET regarding the “DSP angle” error message. Apparently, this is no a problem. It is some kind of “hiccup” produced by the INU that does NOT adversely effect the data. Paul is going to run through a raw data file after the tape change (12L) to make sure all the beams have the appropriate header information (RC).

2230 UTC – Skies are mostly clear with Cb’s visible far off in SW-se quads. Some mid level altostratus and upper level cirrus.

Thursday, 29 July 1999

Changed tapes at 00 UTC.

Archived tapes:

RHB1990728 : 27 Jul 99 – 2359 UTC 28 Jul 1999 : 347? Files

RHB2990728 : 27 Jul 99 – 2350 UTC 28 Jul 1999 : 355? Files

We shut down at 0017 to check the antenna and restart Iris to see if we can remove some of the error messages. Nathan is doing a zauto to check the radar.

0224 UTC We are back scanning after checking radar, zauto and fire drill.

0240 UTC The other NOAA ship is fast approaching from the east. There is some echo developing to the South at around 100 km. Nothing very well organized but a few groups of cells with cores to 40-45 dB south and southwest (rc).

0410 UTC TRMM OPS called and requested that we continued to scan from bottom up. We will continue to do so in the mean time and hopefully do a test before returning to port. We are planning on an echo intercomparison later tonight if conditions are favorable. I would recommend an equidistant echo with no intervening echo. At the moment, we have scattered convection mostly in the southern quadrants. There are

scattered 40-50 dBZ cores with these cells. Most of the cells remain disorganized in nature. Seas remain calm.

0430 UTC TRMM OPS called. We decided to do an intercomparison of radars using the 0436, 0441, and 0448 volume scans, with the focus being on the 0441 volume. The echo that was chosen was located at a range: 24 km, az: 286 and at a lat: 8.4215 N and lon: 167.5144. In the lowest tilt, we found a maximum reflectivity of 52.6 dBZ. The echo was about 10 km in diameter and had an echo top height around 8 km. Widespread convection continues to develop in the southern quadrants. There is an unorganized line of convection extending from NW to SE and about 200 km long and 50 km wide. Maximum reflectivity is about in the lower 50 dBZ range. Activity really developed in the last couple of hours in comparison to the suppressed conditions earlier today. PK.

0720 UTC Most of the echo has moved off to the NW out beyond 100 km. Otherwise, activity looks pretty suppressed at the moment. It is just getting dark on the ship.

0830 UTC Scattered cells moved through the DD lobes between ~07-08 UTC, moving off to the west NW. By 0830, the cells had consolidated into a line oriented roughly east-west and extending several hundred km's in length about 100 km distant from the radar. Radar loop shows a small group of cells which popped up around 08Z, east of the Kwajalein atoll. This set of cells intensified and moved west across the Island at about 0845 UTC. Reflectivities are in the 35-40 dBZ range. The line is oriented NW-se and appears to be the only feature moving west (as opposed to NW). It is not clear from the loop whether this feature was generated from outflow of convection off to the NE of Kwajalein. Xsections of cells 50-70 km distant near 0730 UTC showed some developed cells with core values of ~ 38 dBZ near 8 km. Cell tops are in excess of 13 km on the line that went over Kwaj as well as in much of the convection off to the NW (rc)

1754 UTC Nice outflow boundary passage north of Kwaj at approximately 1730 UTC. Right now, I adjusted the RHB-RHI azimuth angles from 92 and 94, to 313, 315, and 317. New line of convection is just forming with a NW to SE orientation. CRA

1812 UTC A nice line of convection has just moved over the ship. It appears to have 40-45 dB cores with this echo. It is raining hard at the ship. The echo at further ranges has been severely attenuated by the rain/echo over the ship. There was a dramatic drop in reflectivity from the previous scan. There is a small area of echo to the N of us. A large area of echo exists to the SW of us. Most of the echo looks stratoform with embedded convection. The convective cells are orientated NW-SE. Everything is moving to the west-NW. Surface obs show the wind out of the s at 10 kts. PK

1825 UTC Rain has ended at the ship and the echo continues to move west of us. Echo continues to develop up towards Kwajalein.

1903 UTC – Rain at ship again – winds gusting to 20 kts – nice squall passing over – RHB sounding its horn in low visibility. Note that IRIS was re-booted at this time. System appeared to hang on generating a cross section. Did not record 1900 and 1905

vol tasks. S-band profiler shows fall speeds > 5 m/s near surface and updraft above 5 km (rc)

1925 UTC – convection moving through west DD lobe. General pattern is for elements to move toward the west-NW with only very loose organization. Stratoform precipitation off to the west does not show significant bright band signature. Tops are in excess of 13 km on many echos in vicinity. Core reflectivities are in the 45-50 dB range (rc).

2000 UTC Rain has stopped on the ship. A couple of the showers during the past hour were pretty intense. There continues to be echo in all quadrants. Most of the echo remains widespread with embedded convection of 45-50 dBZ maximum reflectivity cores. Echo top height product shows tops (10 dBZ threshold) reaching and extending above the 13 km level (rc)

NOTE: From 1812 to about 1930 UTC the scan are out of sequence because we had to restart iris on both systems and manually send the files to tapes. Only the 1900 and 1905 volumes were lost during this time (pak).

2210 UTC Echo coverage was starting to decrease over the last hour as precipitation moves off to the northwest. We are still under stratiform precipitation at the ship with nimbostratus to the north and cu and broken nimbostratus visible to the south (clear areas visible). Most echo is off to the NW of Kwaj but there is still some coverage in the east lobe (NE near Kwaj and se near Namu). Bright band showing up west and northwest of us. Echo coverage is pretty ragged (rc).

2324 UTC – talked to TRMM ops. They want to reduce the scan top strategy to 8 km. However, we are seeing tops to 12-13 km around us. Talked with Courtney and Bob Houze: for 2324 UTC vol, echo top heights in region ~ equidistant from RHB and Kwaj (NW of us – SW of Kwaj), they see tops (using 10 dB threshold) of 6 km. Our tops in that region with same threshold are 8-10 km. Agreed we need to evaluate the data from the volumes we exchanged earlier today (990729 0441 UTC) and see if we can determine what is causing the discrepancy. Preliminary analysis shows that RHB radar is more sensitive than Kwaj (based on low level tilt data). Solar cal tests done in port showed our pointing angles looked good. Zauto yesterday showed good comparisons with the test pulse. Need to do a sphere cal when possible. Note, possible aircraft mission later this afternoon based on weather conditions (rc).

Friday, 30 July 1999

0000 UTC Changed tapes:

Tapes archived:

RB1990729 : 0122 – 2358 UTC 29 July 1999 : 402 files : Some files might be out of order.

RB2990729 : 0000 – 2358 UTC 29 July 1999 : 407 files : Some file might be out of order.

Most of the echo continues to dissipate in the radar coverage. Some weak isolated cells exist to our north around 100 km. PAK

0024 UTC Offline for zauto. Results look consistent.

0036 UTC Turning and burning.

0245 UTC – convection really dying out. Not much echo on the screen. Forecast from ops center calls for a wave to move through later tonight – maybe that will stir things up. Conditions outside: few cu fractus in se quad, some mid level altostratus and cirrus all quads (rc)

0530 UTC – almost nothing on the screen to look at except a couple small groups of cells 50 – 80 km south of us (40-45 dB cores) and growing congestus along the baseline 25 km to our north. Ops center called and told us the Convair and DC8 are flying the small group of cells to our south. They will remain on station and try and capture the TRMM overpass near 2100 UTC (rc).

0550 UTC – communications with ops center. They have the 0448 Z volume from yesterday available at the UW ftp site (the 0441Z volume we picked up this morning only had the 2 lowest sweeps in it) – rc

1433 UTC – Very quiet night. Have had no echoes until now. Some weak echoes approaching from the East. Still a ways off, but that's all we've seen tonight.

1729 UTC IRIS had a hiccup. The 1729 ingest file for that volume scan was tagged with a # sign. Apparently that is a bad file. After that time, it would not generate any raw (or others) products even though the radar was running. I shut down IRIS after the 1805 volume and restarted. I noticed that file was bad in startup and therefore automatically deleted. After restarting all the files after 1729 were able to be generated and written to tape. They are out of sequence from 1729-1805 UTC. There is no volume scan at the 1812 time period because I was dealing with this problem. PK

1824 UTC We are back to scanning. The activity remains suppressed. There are a group of isolated convective cells to our SW. They are very scattered and have a maximum size of around 10-15 km. The max reflectivity is around 40 dBZ in these cells. There are larger, more organized cells off to the East at a range of around 100 km and beyond. These echoes are on the order of 50 km in size and about the same intensity dBZ cores. Echo tops heights are around 7-8 km. The systems are propagating to the east at speeds of around 50 km/hr. There is a broken altostratus deck over us with shallow cumulus congestus at low levels. A lot of these clouds are producing warm rain showers. PK

1850 UTC I noticed that the PPI products for the 13 km A volume had a spurious time in the product output and had stopped the product generation. The bad time was at 0836 JUL 1999. It always seems to jump ahead for some reason. PK

2110 UTC – scattered cells and groups of cells (each complex < 25 km in extent) mostly south of our position. Features are moving almost due west-southwest. Time loop shows that the cells tend to have a lifetime of about 1 hr max. Cell tops are 8-10 km mostly (one poked its top to about 12 km over Namu for a brief period). Visually, we have some low level cu and congestus and mid level altostratus (one congestus with a rain shaft to the s-SW) – rc.

Note mooring positions provided from NOAA ship KiMiMuana: east buoy (8° 29.04' N, 168° 07.50'E) and west buoy (8° 33.06' N, 167° 18.8'E) - rc.

2130 UTC – talked to ops center. They want the RHB 2324 UTC file from 990729 to be transferred to the UW ftp site. Jeff Otten has a request from NOAA ETL to transfer daily flux files via ftp. I've asked the ops center if that's ok with them (to dump it into the same UW site) - rc

2225 UTC – light rain at ship – very brief shower (rc)

2300 UTC – trmm ops wants a radio check every hour at the top of the hour (rc)

Saturday, 31 July 1999

0000 UTC Changing tapes

Tapes archived:

RB1990730 : 0000 UTC 30 July 1999 – 2358 UTC 30 July 1999 : 361 files : Few files out of sequence

RB21990730 : 0000 UTC 30 July 1999 – 2358 UTC 30 July 1999 : 361 files : Few files out of sequence

A few isolated convective cells exist to our south. All the echo is slowly moving to the west. Maximum reflectivity is around 40 dBZ in these cells. The top product shows cell reaching a height of around 7 km. PAK

03 UTC – few isolated cells, mostly to the south of us – nothing holding itself together longer than 45 minutes or so (rc)

0500 UTC – A few isolated cells exist around the area. Activity has not changed much the past few hours. Pk

0545 UTC – radar down to grease gears and so sun track (rc).

0645 UTC – We did a sun track. According to the program, we adjusted our elevation angle 0.8 deg upward. PAK

0700 UTC Ops center called. We switched the radio frequency 47.55 for night time operations. Just a few scattered echoes in the region. It is interesting to note that the surface winds have switched to the west and have become very light (5-10 kts). It is quite suppressed in the area PAK.

0720 UTC – back up and running (rc)

1200 UTC Activity continues to persist mainly along an east-west line centered on the *Brown*. We are running RHB_13km_A and we still are not topping them out at 27.5 degrees tilt. Large area of stratoform rain centered directly north of Kwajalein over the northern most half of the atoll. Maintaining hourly communications with the Ops center as requested. Cathy has been answering questions for them about some Internet applications for the local website. CRA

1300 UTC Another odd looking pattern to note over the past hour and a half. There appears to be some sort of a surface boundary aligned WSW to ENE propagating slowly to the SE. Showers are developing along the line, but just as soon as they do, their tops are sheared off in the completely opposite direction as the boundary's propagation. Also, the area of stratoform precipitation continues over the northern half of Kwajalein Atoll. It is very unfortunate that the wind data did not come in from the sounding launched at 2245 local. However, hope remains for the next sounding due to launch in approximately 30 minutes. CRA

1330 UTC On the hunt for outflows. Nathan has adjusted the thresholding values (to what, I do not know at this time) which has helped some at bringing in some more detail at the edges of the storms. Scattered convection still persists around the entire RHB radar coverage area. These are the highest topped storms I've seen since coming out here. At 27 degrees, we are still getting returned energy into the 30dBZ range. One more thing, I had not noticed until now, but the colors displayed on the radar screen should be re-adjusted. Right now, the first color that is used (the lowest dB readings) is a light blue/purplish color that is difficult to distinguish from the blue water background. I will make this suggestion to Nathan tonight and see what happens. CRA

1355 UTC LTCDR Rossman just informed me that he is having a difficult time keeping the ship in a fixed location. It's not that the wind is blowing too strongly (about 7kt out of the west), but that the current is making staying in one place quite a chore. CRA

1440 UTC The surface feature that was aiding in generating the showers we've seen in the past few hours is no longer distinguishable. However, another line of showers is now moving directly toward the RHB from ERU and just west of Meck. Several of the showers I mentioned from earlier seemed to have formed a stratoform rain complex directly to our east at a range of approximately 100 to 150km. Min-Joeng's sounding

went off successfully and wind data is coming in. Also, Nathan is trying to hunt down the problem Iris is having in archiving throughout the day. CRA

1530 UTC Min-Joeng and I identified an area of strong convergence immediately to our East just within the 100km range ring. I am performing two RHI slices through the convergence area at 92 and 94 degrees at this time. CRA

1550 UTC Still watching the convergence off to our east. It appears that it has gone from a more easterly track to one that is more northerly. Also, the showers that were heading south from ERU and Kwajalein seem to be dissipating in the last few scans...much to the liking of those Ops Center personnel who will have to rid home in this rain soon! Overall, the things seem to be calming down just a bit. No pronounced area of new development except for a few scattered showers around. CRA

1600 UTC The surface boundary I mentioned back in the 1300 UTC entry is long since gone now. But upon examining the velocity patterns over the last 2 hours, I've noticed that where this boundary intersected the stratoform rain to our east, we picked up a relative maximum of 13m/s outward flow in the tops of the clouds there. This maximum traveled in the same direction with the same speed as did the boundary near the surface. I suspect that maybe the boundary helped to tilt some of the updraft winds eastward. That might explain why we had our highest velocity measurement within these stratoform rainclouds. CRA

1655 UTC For some reason that I can not figure out, the display in the computer lab is not receiving the products anymore. I've tried restarting iris within the "Radar" window with no success. The only place that I can get the loops to work now is in the Pilot House. I may have to leave this one for Paul when he wakes up. Not much in the way of new activity has formed. There is a cell with a core of about 35dBZ south of us and another one similar to it to our west. Also, the area of stratoform rain still continues to our east with little or no movement detected. CRA

1754 UTC There appears to be even less activity now than before. The cells mentioned above are smaller, but there is also a couple of new cells developing to the southwest, with a core of about 45 to 50 dBZ.

1825 UTC We seemed to have problem with IRIS down in the computer room. IRIS stopped working after the 1536 scan. We solved the problem by restarting IRIS down there. I had to resend the products from the upstairs computer to downstairs over the network. The result of this is that the files will be out of sequence for this period. All the 13 km vol A scans will be grouped together, 13 km vol B together, surv together, and rhi together. The best procedure for this problem is to restart IRIS on the "hung" computer. Mount and Record the exabyte tape. Go to the Radar computer and under Product Output and Device select Network to RH Brown 2. Make sure you are looking at RAW products. Select the files that were not sent to tape on the other machine and on the far right column, hit the right mouse button and select send. Do all of the files that are

missing on the other machine. The HP downstairs (RHP2) should automatically start archiving as the files are sent over. PK

Weather wise: It looks like the echo coverage continues to decrease. They're a few isolated cells to our SE and SW and a small line of convection 25 km to our N. It is about 50 km long and orientated W to E. It might be a good comparison echo. The wind has switched to the S with speeds of 5 kts. PK

1900 UTC I called TRMM OPS and asked if they would like to do another intercomparison with the small line developing between the two radars. We agreed to exchange the 1900 UTC scan. The line extends W-E and is about 50 km long. It is weakening on the eastern edge. There is a nice cell on the western side about 32 km from us and KWAJ radar with dBZ values around 45 with a max around 47 dBZ. Echo top height with this cell is around 6-7 km. I printed out the echo for comparison. PK

2037 UTC Most of the echo has dissipated. A few very small cells (< 10 km) are located about 100 km to our West. Wind has switched back to the WSW at the surface. PK

2045 UTC – visually, we have scattered cu congestus and cu fractus, few altostratus and cirrus. Much of the congestus appears to be oriented along a line draped to our north (rc).

Sunday, 01 August 1999

0121 UTC We have been checking why our echoes seem to be factor of 2 too far. After checking the prf and bin spacing, we tried changing the pulse width to 0.8 us. This seems to bring the ranges back to the correct values. To verify that we are correct, we are heading to line of sight of land to ping a ground target. We confirmed this by the ship's navigation radar. Our targets match in range and azimuth to what was detected by the S band radar on the ship PK

I also changed tapes.

Tapes archived:

RB1990731 : 0000 UTC 31 July 1999 – 0121 UTC 01 August 1999 : 361 files : No problems.

RB2990731 : 0000 UTC 31 July 1999 – 0121 UTC 01 August 1999 : 360 files : Files out of sequence between 1536 and 1800 because of network problems.

0140 UTC we are moving towards Kwajalein. We have stopped radar scanning for the time being. PK

missed the 02 Z launch due to transit of the ship to Kwaj (rc)

0205 UTC We have pinged Kwajalein. The sidelobes are even showing up off the island. The target is right on.!!!

0212 UTC We have selected this volume scan to compare with Kwaj. We have no turned around and heading back to station. PK

It looks like we have resolved the issue of why we were a factor of 2 off in range. When using the 0.5 us pulse width, our range was half of what it really was in the data i.e. bin space was really 125m instead of indicated 250 m. We are not sure why this happened and need to look in to if it is hardware or software issues. We measured the pw and it was 0.5 us when requested a 0.5 us and 0.8 us when we requested that pw. When using the 0.8 us pw we or bin size was correct and we could ping Kwajalein. Therefore, all tasks were changed to the 0.8 us pw. We are also doing a zauto at this time to check the calibration.

0300 UTC We are back on station. PK

0309 UTC We are back up and scanning. There are few isolated cells located around and north of Kwaj. They are only around 50 km in diameter. The maximum dBZ is around 45. Echo top heights around 6-7. Almost no convection exist south of Kwajalein. PK.

0315 UTC Call from trmm ops – aircraft mission for this afternoon is on hold (rc)

0450 UTC – scattered cells drifting north out of the dual Doppler lobes (rc)

0615 UTC – aircraft will takeoff at 0640 Z to sample convection east of Kwaj – mostly north of DD lobe (rc)

0730 UTC changed the max range on the surveillance task back to 300 km – change will go into effect at 0774 UTC. Surface winds backing around to se now (rc)

1200 UTC The Ops center radioed that since the hourly contacts between the Ops center and the ship have not been reliable, they are going to have their radio turned off except for 10 minutes before and 10 minutes after the hour. CS

1455 UTC Not a single echo on the scope. I will be using the Surveillance scan to test the new thresholding settings as outlined below.

Here are my initial changes:

- 1) T data will now be “All Pass” instead of “LOG”
- 2) Z data will be unchanged
- 3) V data will now be “LOG” instead of “SQI & CSR”
- 4) I’m leaving W alone for now.

Also, I am going to set the thresholding limits to lower levels. The values are:

LOG 1 .6

SIG no change

SQI .65 .4

CSR no change

With the above changes, I noticed that the maximum intensity of the cells to the northwest at a range of >200km has decreased. Of importance, the areal coverage of the stratoform rain in this area has increased. Also, some smaller echoes are now evident within the vicinity of the isolated showers that are in the same NW quadrant, but at a

range of <200km. I am going to wait for a few more scans to determine if this setting will work. CRA

1545 UTC It is my opinion that these new thresholding values will work out just fine. We are now seeing more detail at the perimeter of the storms and the lowest displayed dBZ value has decreased from approximately 20dBZ to 10dBZ. I printed out this section of the screen for both the 1458 and 1510 surveillance scans. As far as rain activity is concerned, still a quiet night out there. No returns outside of the NW quadrant of the radar scope.

The error message, "DSP AZ Angles exceed 30 degree span" is still coming up. CRA

1825 UTC There have been no echoes at all since at least 0900 UTC on the RHB radar, much less anything in the DD lobe. The Surveillance scan was the only scan that could pick up anything and even those reflections were 200km away. CRA

1905 UTC – talked to Casey about the threshold tests he did on the surv. Scan. Will leave changes and try and perform more tests tonight – we need more echo on the display (especially < 100 km distance) to evaluate the effects – no other tasks have been affected (rc)

1920 UTC – not hardly an echo to look at. Surface winds are still s-SW at < 10 kts. Sky has few cu fractus/humilis, alto stratus (alto cu?) and few cirrus (rc)

Monday, 02 August 1999

00 UTC Changing tapes:

Tapes archived:

RB1990801 : 0148 UTC 01 August 1999 – 2358 UTC 01 August 1999 : 320 files : no problems

RB2990801 : 0148 UTC 01 August 1999 – 2358 UTC 01 August 1999 : 320 files : no problems

Radar shows no echo on the screen. It has been about the same since coming on duty at 1800 UTC. Sky observations show mostly cirrus and a few (very) shallow cumulus clouds. Satellite imagery showed all the activity north and west of Kwaj. It looks like we are under a ridge. Surface winds are out of the SW at 3 kts. Seas are calm. I guess it is a day for the beach. We are going to try a sphere cal later today. PK

0145 UTC – took the 02 sonde up to the flux tower (2nd level of the scaffold about 15' away) with the psychrometer prior to release. The flux tower and psychrometer RH's were within 1-2% but the sonde was about 10% low. Tomorrow, we will try the same thing but let the sonde equilibrate near the tower for 5-10 minutes before taking the measurement (rc).

0323-0401 UTC We performed a sphere cal. The sphere was tethered off a 200 m line at azimuth of about 185 and range of 5.5 km. We were seeing the sphere at angles between 1-2 deg. At 0401 the balloon was released and we tracked for awhile. PK

0424 UTC We began scanning normally again with 13 km scan. No echoes are being detected. It is a extremely calm, clear day. It is quite warm out on the deck. The guys in the RIB (Rob and Dave) spotted some whales out there. PK

1617 UTC All's quite for another night of little activity. We are in a kind of weather information void on the ship save for satellite imagery, but it appears the ridging is taking its toll. Only a few returns on the screen tonight and those are from well south of the DD lobe extending across the southern 1/3 of the area. CRA

1836 UTC We have echo! A few scattered cells are starting to develop to the east and south of us. The echoes appear to be isolated convective showers with max size around 20 km and dBZ values in the 40's. Surface wind has switched back to an easterly direction and have increased to 8 kts. PK

1830 UTC Yesterday's sphere calibration showed the target had a maximum reflectivity value of 26 dBZ in several scans at a range of 5.625 km and height above sea level of 120 m. The best file for this calibration was recorded at 0348 UTC 02 Aug 1999. We are going to check back with Wallops for the theoretical value. PK

2200 UTC Echoes continue to develop and move westward to the south of us. A few isolated cells are developing north of Kwajalein. The echo to the south is starting develop into small line about 25-50 km long and orientated N-S. Max reflectivity values are around 45 dBZ. Surface wind at the ship is easterly and has picked up to about 12-14 kts. Max tops of echoes to the S are around 8 km (10 dBZ threshold). PK

Tuesday, 03 August 1999

Tape Change

Tapes archived:

RB1990802 : 0000 UTC 02 August 1999 – 2358 UTC August 1999 : 346 Files : Sphere Cal.

RB1990802 : 0000 UTC 02 August 1999 – 2358 UTC August 1999 : 341 Files : Sphere Cal.

0030 UTC Echo continues to develop south of us. Most of the echo is beyond the 100 km range. Reflectivity max. still range 45-50 dBZ. It looks like a precession of small lines of convection moving westward. Most are orientated NW-SE. There are a few showers N by Kwajalein. It looks like echo coverage has been increasing over the past few hours. PK.

0115 UTC A W-E line of convection continues to develop 100 km S of us. dBZ values are maxing around 50 dBZ. Echo top heights with this system is around 10-12 km. It is propagating WNW'ward. The line is around 300 km and 40 km wide Echo is developing N of us and seems to be converging with the line to the south. PK

0122 Rain shower on the ship. PK

0130 UTC – talked to ops center. Aircraft will takeoff today at 0330 UTC and fly through the overpass at 0650 (?). Ops center has called for going with the 10 km tops strategy starting at 02 UTC for increased vertical resolution. We are watching some linear features (< 75 km in length) moving through the east lobe toward the west. These lines all have a roughly n-s orientation. Last tops product showed that these lines generally have tops below 8 km. Currently, we have light showers at the ship, with a nice rain shaft visible off to the west – surface winds are out of the n-ne (rc)

0154 UTC Rain began, A couple of gauges (precip 5 and 9 are reading 40 mm/hr). It is rain heavy at this time. The rain is from a small NNE-SSW line over the ship. Reflectivity value is approaching 45-50 dBZ. PK

0156 UTC Main rainshaft over us. PK

0200 UTC Switched to 10 km volume scans. Heavy rain continues to fall at the ship. The gauges are indicated max rainfall rates exceeding 90 mm/hr. NOTE: 10 km A scan did a scan top down scan. We switched the elevation angles to scan upward starting at 0212 UTC. PK

0209 UTC Rain ended at the ship. PK

0248 UTC A moderate echo is over Legan. Hopefully, disdrometer is working. Note: there is good area of convection located in the eastern dual doppler lobe and is moving westward. Because we switched to 10 km mode, we were unable to top the echoes, which were approaching 10-11 km heights. The echoes are orientated in more of a cluster.

0258 UTC We are doing a few RHI's over Legan and the profiler.

0300 UTC We switched back to the 13 km scanning strategy to reach the echo top heights. PK

0334 UTC Rob and Paul downloaded disdrometer data. DM

0425 UTC sounding launched (0600). We took the radiosonde measurements at the IMET tower to check for T and RH consistencies. IMET: T=26.1, RH=83. Sonde: T=26.0, RH=81. Psychrometer reading was also taken at the IMET tower. RH calc gave a value of 84. The purpose was to check for radiosonde accuracy. DM

0515 UTC – Largest region of convection (remnants of the line draped south of us several hours ago) has moved 100 km west of us. Scattered echo is still moving through the RHB coverage area (westward propagation), though there is not much in the DD lobes at the moment. We have the remnants of some convection that passed south of us overhead now (sf but no precip). Last check with RTD showed that we were not topping all of this with the 13 km strategy (including echo just clipping the southern portion of the east lobe) so will stick with this for now (rc).

0550 UTC – call from ops center. DC8 is flying echo mass (mix convective and stratiform) off to the SW about 100 km distant with Convair (Citation has a radio problem and is down). DC8 CPI probe is working well – recording sc liquid water and small ice particles at 39k feet flight level. Next target for the aircraft is in the small linear band feature in the east lobe. Currently, this echo has 45-50 dB cores with echo tops of 9-10 km. There are several other linear bands to the rear of this line. Suspect there must be more shear in the profile today to form these linear bands. Still not topping convection remnants just to west-sw of us(rc).

0630 UTC – beautiful outflow boundary with low level scud cloud off the starboard bow (digital camera pic) from line just to our e-ne. Bridge reports sighting of aircraft around this cell (rc).

0640 UTC – time loop shows that these linear bands are building along their southern flank as they propagate westward. Light rain at ship

1200 UTC Strong shower moved over the ship. Lots of interesting outputs from the profiler downstairs. It's nice to see that the east to west pattern is back giving us some sought after rains. CRA

1530 UTC Things are beginning to get quiet again. No rain upstream from us as the last bit just moves out of the DD lobe to the west. CRA

1910 UTC – doing sensitivity tests of the thresholds on Z and V fields. Started running sequential PPI's (surveillance task only). Decided on the following: T should be all pass; Z should be only log (0.8) – took out CSR as it appeared to make no difference; V should be SQI and log – here we decided to move SQI down from) 0.65 to 0.4. These changes will be implemented on all tasks starting at the 00Z tape change (rc).

2000 UTC – Back on schedule. Not much on the screen to look at but a few scattered echos to our north. Winds have picked up – 14 kt out of the e-ne. Sky shows scattered cu mediocris and congestus all quads with some upper level cirrus (rc).

2100 UTC A few echoes linger to the NW, but are on the decrease at this time. There is no other developments in the remaining quadrants. Wind speed is 15 kts out of 80 degrees. It has really picked up in the last few days. Some upper level cirrus and cumulus can be seen from the ship. PK

2200 UTC The radar shows that we are almost back to severe clear in terms of precip echoes. Sky observations show a layer of cirrus and scattered, shallow cumulus. PK

2350 UTC A small shower went over the ship. We got the mysterious jump to 1 day ahead in the ppi product (vol a), removing... PK A few very small showers exist in the region.

Wednesday, 04 August 1999

Changing tapes:

Tapes changed:

RB1990803 : 0000 UTC 03 August 1999 – 2358 UTC 03 August 1999 : 427 files : None

RB2990803 : 0000 UTC 03 August 1999 – 2358 UTC 03 August 1999 : 432 files : Few files out of sequence

Changing threshold parameters as indicated by note above PK

0015 UTC – Jeff Otten said that the power supply for the flux system went out last night (~17L-1030L). He replaced the supply and everything appears to be working ok (rc).

0010-0110 UTC We went offline to check the antenna, do a zauto, change some of the threshold in the scans. Everything looks good.

0112 UTC Back online and scanning. PK

0440 UTC – 0600 radiosonde launch completed with sonde measurements again taken at the IMET tower to check for accuracy of sonde humidity values. IMET, sonde, and psychrometer readings (also taken at IMET tower) were in agreement again today. We want to try the same thing for a nighttime sounding launch. DM

0625 UTC – a lone echo 80 km to the south.....(rc)

1055 UTC There is a large 50 km by 70 km echo about 45 – 50 km to the south of the ship. It looks like there are dBZ values ranging up to about 45 dBZ. Looks like it is moving westward and possibly northward.

1230 UTC Lightning spotted about 230 degrees from true north. Echo is approximately 60km sw of the ship, with dBZ values near 45. DM

1530 UTC All the rain is staying well to our south tonight. It appears that this will be the setting for the rest of the night as there is no new activity developing upstream to our east. CRA

1640 UTC Cathy and Min-jeong found the four locations to take the cloud pictures. From tomorrow, we will take pictures every 2 hours between 1900UTC and 0500UTC for each site. MJK

1900 UTC We are fighting a strong current and offset wind, which is causing the ship to drift off station a bit, but we are still really close to being right on. The line of convection continues to remain 100-150 km south of the radar. It is moving westward. Maximum reflectivities are in the 40's. It is really quiet elsewhere in the vicinity of the radar. PK

2129 UTC Only a few showers exist within the coverage region at the low level. The upper tilts indicate a weak stratiform deck above us. A sky observation has several cumulus congestus in the area and mid-level cloud deck off to the east. Pretty quiet otherwise. PK

Thursday, 05 August 1999

Changing tapes

Tapes Changed:

RB1990804 : 0000 UTC 04 Aug 1999 – 2358 UTC 04 Aug 1999 : 343 files : none

RB2990804 : 0000 UTC 04 Aug 1999 – 2358 UTC 04 Aug 1999 : 343 files : none

From 0005 to about 0136 UTC we were offline doing a zauto (looked good) and implementing a new overlay map. I added the dual-doppler lobes and put the buoy and profiler locations. PK

0136 UTC We are back up and running. Not much echo to look at as everything is suppressed. PK

0320 UTC – a few scattered cells up north of Kwajalein – isolated cells with 30-35 dB cores. Mostly cu humilus and mediocris with scattered cirrus in our vicinity (rc)

0400 UTC – A few scattered isolated echoes around the area. Otherwise, is very suppressed in region around the ship. Surface wind is out of the NE, with speeds around 10 kts. Not much to talk about otherwise. PK

0750 UTC – echo coverage increasing over the last several hours. Mostly scattered cells from the east moving west-sw. Similar to the other day, am seeing tendency for cells to form small bands oriented roughly perpendicular to low level wind and growing along their southern margin. However, individual bands do not seem to last long – forming and dying over the course of several hours. Low level max reflectivities are in the neighborhood of 50 dBZ. Echo tops are all below 8 km (rc)

1510 UTC Lots of rain tonight scattered around the area. Right now, we are sitting under a pretty good storm...heavy rain and sustained winds at 30kt. Several times, we

could hear Sarah at the Ops center attempting to radio us. We would try to reply to her, but had no success. I suspect the rain is having an adverse effect on the radio. However, we should still be able to communicate this far out. I will suggest that maybe somebody should look into it tomorrow during the day. Meanwhile, I resorted to using the INMARSAT-M phone to call the Ops center. I reached Adam Sobel again and he informed me that they were trying to reach us in order to see what scanning strategy we were using. I told him that we were scanning with the 13km height scan to which he replied that they were using the 10km scan!! He said that they were going to see what could be done about switching the scan to the 13km strategy, but would have to wake somebody up in order to do so. When I hung up the phone, they were still going over options. I hope they can change it to 13km because these storm tops are well over 10km. Also of interest, he said that they had a note in their logbook that they switched to the 10km height. Why were we still on 13km? Shouldn't we both be scanning together? If one party can not hear the second party, should they go ahead and make a change without informing us? I'm wondering where the communications broke down. At any rate, we are getting nice data for the most part. CRA

1545 UTC Ran two RHI's. One at 90 and another at 92 degrees azimuth. I'm having problems getting the RHI products to work properly. It seems that the product is not centering the display window on the ship. All I see is a small portion of the RHI. I will let it scan a few more times then take the RHI out of the task scheduler.

Lt. Borland tried increasing the power output in the radio with no success. The radio problems remain a mystery! CRA

15-17 UTC We were having trouble communicating with OPS center. We boosted the power and was able to talk to harbor control. It was determined that the problem was at their end and they would be working on fixing the receiver. We switched and are remaining on the daytime frequency. PK

1800 UTC Things quieting down off to our east. No more rain showing up on the radar in that direction. I took the RHI out of sequence shortly after my last log entry. Regular cloud photographs start today per Min-Jeong's suggestion. CRA

1841 UTC Sunrise. Sky observation that most of the clouds must have moved westward. All that remains are scattered shallow cumulus and cirrus. The seas are quiet rough as large swells are really rocking the ship (biggest that we have seen). Lt. Borland indicated that we had 30 kt winds with the system that moved over us at 1530 UTC. PK

1900 UTC From analyzing the movie loop of PPI's, it looks like we had rain on the ship from about 1510 UTC to 1630 UTC. It looked like it was heavy around 1530 UTC as the main squall past over the ship. It looked like a semi-unorganized squall line on the display. It looks like it developed or moved in from the east several hours before and propagating rapidly westward. By 1712 UTC, the system had moved out of the western DD lobe. The main system did go through the DD lobes. By 1840 UTC the system had reached the 150 km range from the radar. Peak reflectivities in the system were in the

low 50 dBZ level. I was not able to create cross sections because the ingest files were already written over when I looked at the event. PK

1952 UTC A few scattered cells are developing to the east. They are about 5 km in size. Quiet elsewhere. PK

2045 UTC A rainbow was spotted on the port side of the ship. We had a light rain shower pass over us at this time PK

2136 UTC Rain on the ship. Numerous, isolated showers have developed in all quadrants. Most of the cells are about 5 km in size with a few approaching 20 km. They are propagating westward. Maximum reflectivity is about 45 dBZ. It looks like typical trade wind showers. PK

2150 UTC Rain has ended as shower has moved west. Winds are out of the southeast at about 5 kts PK

2310 UTC The small convective cells are trying to merge and form small W-E orientated convective lines. It would be interesting to see the wind profiler to see how the two are related. The amount of convection has remained about the same. All the echo keeps moving WNW. PK.

Friday, 06 August 1999

Changing tapes:

RB1990805 : 0000 UTC 05 Aug 99 – 2358 UTC 05 Aug 99 : 350 files : No Problems

RB2990805 : 0000 UTC 05 Aug 99 – 2358 UTC 05 Aug 99 : 347 files : Few files out of sequence.

Showers around the area. One moderate coming towards us. PK

0027 UTC Heavy shower over the ship. We have 20 kt gusts from the outflow. PK

01 UTC – precipitation in vicinity for most part seems to have no apparent organization – scattered showers with echo tops < 8 km. There have been several lines – now with nw-se orientation but very short lived. Soundings show that the pronounced mid level (500-300 mb) dry layer eroded out last night (14Z) but it appears to have built back in again this morning (20Z)– suspect this is why convection is random and shallow. Interesting that the low levels (below 800 mb) slowly moistened up by the 11Z launch yesterday, before the mid level air. Now we're pretty dry through the column again .(rc).

0120 UTC – talked to ops center. Aircraft will be flying at 03 UTC today for what I understood to be a flight within 50 km of the ops center? Will talk to ops center at 0230 to discuss scan strategy. Right now, they are running 10km strategy – we are running 13 km strategy. Looks like we could go to 10 km shortly (rc)

02 UTC switched to 10 km top strategy

0230 UTC – talked to ops center. DC8 and Convair are both departing at 03 UTC – will keep us updated. Both radars are going to use the 10 km strategy. Not much in the DD lobes to look at. A small group of cells with a nw-se orientation are out in the southern portion of the east lobe – max dBZ's are 40-45. Most echo is off to the north and west of us (rc).

0420 UTC – convection really on the wane. There is hardly an echo in the DD lobes or across the entire domain (rc)

0440 UTC – call from trmm ops – aircraft are targeting an echo just n and w of Kwaj – looks to be just n of Legan (rc)

0510 UTC – aircraft operations complete (rc)

0645 UTC – not much of an echo to be found anywhere (rc)

1100 UTC – Activity is very suppressed. There is almost no echo in the 150 km range of the radar except for a few tiny cells to the far NE. PK

1112 UTC – Switched back to the 13 km scans in case of convection develops in the overnight hours as it did last night. PK

1530 UTC Another quiet night in the books. Night crew has been busy trying to get Solo up and running and making some plots for radar QC. Otherwise, no echoes to mention. CRA

1810 UTC Received the following error message from Iris: Inconsistent sweep start time in RAW product. Note that this message showed up on the “Analysis” and not on the “Radar”. CRA

1900 UTC A few scattered echoes are seen within the 150 km range, but overall everything is very suppressed. PK

2050 UTC Only scattered echoes are being detected by the radar. Sky observations show small warm rain showers in the area. Widely scattered. Everything looks squashed. The cumulus clouds looked sheared in the upper levels. PK

2250 UTC – mostly scattered echos moving across domain – the majority of these are > 100 km from the RHB (rc)

Saturday, 7 August 1999

0010 changed tapes

RB1990806 0000UTC Aug 06 1999-2358UTC Aug 06 1999 360 files--- no problems

RB2990806 0000UTC Aug 06 1999-2358UTC Aug 06 1999 360 files--- no problems
DM

0245 UTC – few echos passing north of Kwaj > 100 km distant. Have noticed on time loop an occasional beam dropout in the low level ppi. On the analysis machine, this appeared at ~az 51 deg at 0134 UTC (surv). Message list shows that the DSP angle error message also showed up on that vol in the az range observed with the missing beam (51 deg is endpoint of az range). Could also be due to antenna ramping down to low level height (0.4 deg) from previous vol scan? Need RDSS or SOLO to properly evaluate this (rc)

0620 UTC – pathetic (rc)

0920 UTC Bridge reported lightning to the NE. The radar shows an increase in convective activity about 100 km to the NE. The cells are only about 30 km in size and slowly moving westward. Low level reflectivity levels max out around 50 dBZ. Convection still remains very suppressed. PK

1840 UTC The sun has risen to another beautiful day. PK

1850 UTC Déjà vu. The radar display shows about the same amount of activity as when I left last night: A few very isolated scattered echoes mostly to the north of us. It looks like weak trade wind showers. Severe Clear and we are ready for a change. A good note is that the radar has been running great and there has been no problems writing the raw data to tape. PK

2220 UTC – not an echo within 150 km – this is the most suppressed (depressed?) I've seen so far in terms of convective activity (rc)

2300 UTC – There is not a echo on the screen. It reminds us of SCSMEX. PK

2315 UTC – Jeff Otten says that the output from one of the scanning polarimeters (2 cm) looks suspect. He noticed the problem yesterday. Basically, no change in voltage output. 0.8 cm polarimeter looks OK. Waiting to hear back from ETL on a possible solution (rc)

Sunday, 8 August 1999

0010UTC changing tapes

RB1990807 0000UTC Aug 07 1999-2358UTC Aug 07 1999--- 354 files—no problems
RB2990807 0000UTC Aug 07 1999-2358UTC Aug 07 1999--- 354 files--- no problems
DM

0530 UTC – finally some scattered echos to look at. One cell just popped up to our NE (35 km) is moving toward the ship (rc)

0630 UTC – cell to our ne is skirting by the ship, moving sw and appears to be decaying somewhat. Max dBZ's were 47 and are now weaker. Light rain at ship (outflow from squall starting about 0620 UTC). Harder rain at 0640 UTC (rc)

0655 UTC- rain has mostly stopped (rc)

0745 UTC – cell that moved over us laid down a small gust front (visible on the time loop) which appeared to spawn another cell on the north side. Nothing has a top above 3-4 km. Surface winds currently out of the ne (rc)

1300 UTC Rain directly on the ship.

1510 UTC Rays of data are beginning to show up missing in the reflectivity loops. I noticed the first one occurred at 1300 and another just occurred at 1458. Widely scattered showers off to the south and west. The flow at this moment is from NE to SW. Another DSP angle error message. I'm wondering if Iris should be restarted? That could just make things worse. CRA

1532 UTC Lightning noted just on the horizon (in cloud) towards Kwajalein. Little echo on radar, but nevertheless, lightning! CRA

1545 UTC Spoke with Nathan about the missing rays. He says that he has seen this occur before during the day and that they are interrelated with the DSP angle error messages. CRA

1801 UTC Nothing much happened this evening. Most of the echos were extremely small, not unlike popcorn in appearance.

1840 UTC A few very tiny echoes scattered about. Really nothing else to talk about except it is sunrise! PK

2350 UTC Still NO echo!!! PK

Monday, 08 August 1999

Tape Change

Tape Changed:

RB1990808 : 0000 UTC 08 Aug 99 – 2358 UTC 08 Aug 99 : 360 Files : No Problems

RB2990808 : 0000 UTC 08 Aug 99 – 2358 UTC 08 Aug 99 : 360 Files : No Problems

0010 UTC Going down to do a zauto PK

0036 UTC Turning and Burning PK

0145 UTC – a few scattered cells 50-250 km south west of our location. Had a brief rain shower pass over the ship about 15 minutes ago. With the exception of one cell about 80 km to the sw, the echo tops are all less than 4 km (cell to sw has tops to 7 km). Cell movement is toward the west-sw, consistent with the low level flow (soundings show ne flow up to about 800 mb) – surface winds are out of the e-ne at 8 kts (rc)

03 UTC – another small cell approaching from the ne. Several cb anvils are visible to the sw – maybe conditions are changing? (rc)

0745 UTC – activity has picked up considerably over the last several hours. Since about 0530 Z, have seen the development of a series of small (<75 km) line elements oriented roughly nw-se, moving to the west-sw. Time loop suggests that the elements are growing along the se margin. The lines appear to be moving pretty fast (~30 km/hr). One of these lines ran right over Kwaj at 0735 UTC with tops to 10-11 km (another one over the east buoy). Tops are mostly in the 8 km range. Reflectivities are mostly in the low to mid 40 dB range. At the moment, we have one line element in the west lobe and one in the east lobe (see pic – image). Surface winds are still out of the ne but have picked up to ~12-14 kts (rc).

Our linux box has somehow been corrupted. The /usr/bin directory was replaced by a file called “bin” that cannot be removed, even by su. We have tried everything to get rid of it and have had no success. We have no idea how this happened, it almost looks like something a hacker would have done but I can’t imagine that happening out here. Paul is backing up the /data and home directories and will then reformat and reinstall linux...this is a real major pain in the butt since we have to iterate on some of the installation settings (rc).

0815 UTC – lightning reported by bridge crew from system that past over Kwaj. Tops are now 12-13 km on this line. Flash rates are ~1/3 minutes and are IC from what I can see. We have the southern flank of another line is about to run us over in the next 10-15 minutes (rc).

0840 UTC – squall on top of us now although it appears to be falling apart somewhat– winds have picked up to 30 kts – hard rain at ship. Time loop shows a nice bow echo line about 100 km north of us, moving west (rc)

0910 UTC- a very thin line forming sw of us about 100 km long oriented nw-se. Can’t tell if this feature formed from outflow or is some kind of gravity wave. If you look at the loop, there is some hint of a rough 30 km spacing of the line elements (rc)

1220 UTC Most of the convection has moved to the west. It has become really windy at the moment with 22 kt wind from the east at the surface. Rocken’nRollin! PK

1300 UTC Storm coming from 45degrees with lightning. NG

1335 UTC System forming, or arriving from the east. Fairly large, about 50 km long by 20 km deep. There are some fairly strong echos in it, about 45-50 max dBZ. CS

1400 UTC Just spoke with TRMM Ops to check with them and see if they are monitoring these storms as they approach. No flight ops tonight, too bad. Right now, we are topping these storms out as low as 14 degrees elevation. I do not want to change to 10km, however, because as the storms approach, the tops will undoubtedly be above 10km. Also, there is no radar operator at the Ops Center who can change scanning tasks. Therefore, we will stick with the 13km scan. Commenced to taking water vapor samples at 1310 and 1333 in preparation for gust front passage (if it holds together). Also, scheduled two RHI scans, one at 90 degrees and another at 92 degrees azimuth. Printouts are also being made as the storms approach. CRA

1450 UTC Just noticed that the product loops were not updating past 1324Z. When I went to check the archived data, it too was not being saved to tape. I found Nathan and we are now working on remedying the situation. Nathan suspects a problem with the exabyte tape downstairs. Meanwhile, the storms to the west have gusted out. They are significantly weaker now. Still some very sparse lightning off our stern, several miles away. CRA

1500 UTC Data is archiving again for "radar" but not for "analysis" just yet. Still no known cause to this problem. CRA

1530 UTC Several more flashes of lightning seen, some to the south. Wind picked up very quickly.

1334 – 1500 We lost most of the raw products. It looked like one of the HP hung and was not able to write products to tape. Nathan restarted IRIS on both systems and things seemed to go back to normal. We did have some echo during that time. PK

1850 UTC The convection we saw during the nighttime hours has begun to die off. There was a W-E orientated line centered north of the ship for several hours last night. It has dissipated at this time and only scattered, small echoes exist in our region. There is some stratiform precipitation at the far reaches of our 150 km maximum range to the East. PK

1908 UTC We are doing a solar track now because our radar engineer sleeps during the day. We are thinking that he is becoming a vampire! PK

1924 UTC Back scanning. Our engineer says our pointing angle is on. There are lots of sea clutter as a result of the strong easterly wind at the surface. Sea clutter out to ~40 km now. PK

2000 UTC – stratiform region dissipating 200 km to our east is associated with a rather large MCS visible on the NOAA IR data (1830 UTC). A few scattered cells with no

apparent organization moving through the west DD lobe at this time – not much else to look at Winds are out of the ne at 16-17 kts (rc)

2115 UTC – OPS center called and let us know that the Convair will be taking off at 1030 LT with the DC8 to follow by 1100 PM. We will be staying in the 13 km volume scan mode to play safe side of topping the echo. There are two lines of convection approaching us. One line is located to the SE of us around 100 km. It is orientated NE-SW and is about 100 km long. Reflectivities are exceeding 45 dBZ. The second line has formed north of the eastern DD lobe. This line is orientated W-E and is about 50 km and not as intense. There are other smaller lines scattered about the region. The wind has really increased at the sfc. We have sustained easterly winds around 20 kts. Swells are approaching 8ft (I would guess). The ship is really pitching and swaying about. It is the roughest that we have seen. PK

2135 UTC Echo top heights are about 8-10 km with this system. It looks like the two lines that formed are the result of a decaying system that can just be seen at the 300 km range of our surveillance scan. There is a large area of stratiform type echo beyond 200 km to our SE and continues to decay. It could be an interesting day. PK

2200 UTC The line for mentioned about seem to be dissipating at this time. The seas remain are rough as ever. PK

2210 UTC – lines to the se and east of DD lobe are falling apart now. Nothing seems to be able to maintain itself for very long, perhaps due to stronger shear? Tops are mostly below 8 km on echos within 75 km of the RHB (rc)

Tuesday, 10 August 1999

0000 UTC A few echoes remain in the area. There is a small line about 100 km to our West. It is about 50 km in length. SFC winds remain easterly about 15-20 kts. Mostly stratocumulus around the ship. PK

Changing tapes:

RB1990809 0000UTC 09 Aug 99 – 2358 UTC 09 Aug 99 331 files: lost data around 1530UTC

RB2990809 0000UTC 09 Aug 99 – 2358UTC 09 Aug 99 331 files: lost data around 1530UTC

DM

0245 UTC – call from TRMM ops – citation taking off to fly echo located 60-80 km sw of our location. The echo consists of a pair of line elements (~50 km long by 10 km wide each) oriented ne-sw. Tops are currently > 12 km. Time loop shows that the feature formed around 0130Z, s-se of us and is moving west, outside of DD lobe. Haven't seen any reflectivities greater than about 45 dB (rc) – will try and generate cross section.

0312 UTC – running 10km top strategy to improve vertical resolution for aircraft. Also doing RHIs on this same echo region. There is not much in the DD to look at. Note that convection to our sw kicked off a nice outflow boundary around 02 UTC. This feature is moving n. toward us now (~40 km from us). Surface winds are still 12 kts out of the east (rc).

0430 UTC – stopped rhi scans (rc)

0450 UTC – switching back to 13 km top at 05 UTC to help top nearby convection (rc)

0626 UTC – There is a very small gust front feature moving north through the Western DD lobe. Otherwise, almost all the precipitation and echo has dissipated in the 150 km range of the radar. We are having some really big swells move across the ship. It has moved the ship off station several hundred meters. Hopefully, activity will pick up later this evening. PK

0630 UTC – Because of the swells, current and wind, we are going to a drift and reposition mode. We will drift no more than 2 km off station and then reposition until the seas calm down. PK

0650 UTC – The little outflow boundary that moved west of us is starting to generate convection and is just about to pass over the western buoy. The dBZ remains weak. PK

0710 UTC – We have reached the outer 2 km limit and are reposition back to station PK

1648 UTC – The PPI display showed about a 3-5 deg sector missing. We should look at the file with the post analysis tools. PK

1800 UTC – We had one of those runaway PPI's on HP1. It was generated from a 13 km scan and it set the time to 1148 11 Aug 1999. Therefore, I products stopped being generated for this scan.

1810 UTC – It looks we have had a large convective system with some stratiform component develop to the north of us during the nighttime hours. A quick look at echo top heights shows the cell reaching heights above 13 km in isolated sections of the system. From the movie loops, it looks like this system has been developing for the last 4-6 hours. The convection is centered north of us about 100 km. It extend E-W for about 300 km. The eastern side remains convective while the western edge has a more stratiform appearance. Maximum reflectivities are around 45-50 dBZ. An interesting feature is seen on the western side of the system. There is a north-south line of convection moving northward into the W-E line. This line is also about 300 km long but not as wide or extensive. The surface winds at the moment are out of the SSW at 6 kts. An area of isolated convective cells have developed to the SE us during the past hour. They are moving to the WNW. The largest echo is about 100 km long. A lot of activity compared to previous days. PK

1910 UTC – Both lines continue to maintain form as they slowly propagate to the west. The N-S line is slowly merging with the W-E line and doing so, decreasing in length. The convection to the SE is becoming more organized as it moves NNW towards us. The largest feature remains 100-150 km in length. The lines are mostly orientated N-S. PK

1912 UTC – We had a bad heading input (error). This caused the PPI display to be flipped over. North echo was in the south and visa versa. PK

2010 UTC – Rob did a cross section through the system to the North. It doesn't show any bright band feature and stratiform. Although it does look like stratiform on the screen. The system continues to move westward and is beginning to decay. The systems to the SE are also beginning to weaken at this time. PK

2024 UTC – A weak bright-band is showing up in the upper tilts. It is circular, which is a good indication that the antenna is stable. PK

2117 UTC – OPS called. Aircraft will be taking off this afternoon if the weather holds. The large system to our north has continued to decay and move east. The echo to the SE has remained intact and is slowly moving NW. The echoes have not really changed in size, shape or intensity during the past hour. PK

2200 UTC – The system to the West has decreased in intensity and looks mostly stratiform in appearance. The echo to the SE is also showing signs of weakening at this time. It still is propagating to the NW. Surface wind is out of the SW at 5 kts. PK
There is a nice stratiform deck over us at the moment.

2210 UTC – OPS called. The aircraft are going to delay an hour until it is closer to the TRMM overpass and hope convection develops to the south. PK

2245 UTC – Echo continues to decay... PAK

2358 UTC – call from trmm ops – aircraft mission this afternoon is scrubbed (rc)

Wednesday 11 August 1999

0005UTC tape changes on RBHP1, RBHP2

RB1990810 0000UTC 10 Aug 1999—2358UTC 10 Aug 1999 370 files

RB2990810 0000UTC 10 Aug 1999---2358UTC 10 Aug 1999 362 files

Reason for file # difference? Rob did something.

DM

Rob accidentally sent ppi products to tape! Should have changed the product times on the product scheduler instead of sending files from product output (rc)

0150 UTC - a few scattered echos north of the DD lobes but mostly quite suppressed. Seas are calm and surface winds are out of the sw at < 5 kts (echo motion appears to be toward the north –rc)

0330 UTC – Talked to Alan regarding one of the NOAA crew members who needs to visit the hospital on Kwaj. The doctors there want to see him at 7:00 am. Therefore, our plan is to leave here at about 0400L (16Z) in the morning and arrive within about 5 miles of Kwaj by 06L (18z). The ship will then launch the RHIB and be at the hospital by 7:00 am. The ship will return immediately to its on-station location by 8-9L (20-21Z). The RHIB will return to the ship later in the afternoon (depending on weather, the ship may go back close to Kwaj or the RHIB will come all the way back here) – rc.

0420 UTC – A few scattered showers around the area, but mostly we are back in a suppressed regime. The planes stood down because of the lack of activity. The forecast is the same for tomorrow. PK

0530 UTC – scattered cells moving n-nw through the east lobe. Tops to below 8 km and core maxs to about 43 dB. One of these just went over the east buoy. Surface winds are < 5 kts, out of w-nw (rc).

0640 UTC – A few isolated areas of convection are scattered about. There is one small cell that is located in the Eastern DD lobe. Tops were 10-11 km earlier but are now down to 8 km or so. No apparent motion to this aggregate of cells PK

0730 UTC – A little more convection is starting to develop to the East. It is basically the same as previous days – Trade wind showers that are isolated and about 30 km in size. No large scale activity expected. PK

0850 UTC – cells in the east DD lobe have grouped into a small quasi line and are now moving westward (surface winds are weak but now out of the east). The line is sort of oriented n-s and is very loosely developed but extends from the northern portion of the east DD to n of Kwaj. Tops range from 8-13 km along the line group. Reflectivities range up to about 48 dBZ (saw one pixel of 53 dB – xsection showed a vertically well developed cell at 0836 UTC with 30 dB up to 7.5 km – made plots). Nothing seems to hold together very long. Time loop shows a little outflow boundary emanating from the southern portion of the line, moving sw toward the ship. We are not quite topping a small cell near the ship. Evolution of convection is very complicated: general tendency for elements to move west but many features are simply decaying in place and others that are moving east or se. Suspect that lack of strong steering winds is allowing convection to organize and move somewhat in a random fashion (rc)

1520 UTC Isolated shower directly overhead. Somewhat interesting flow around the area. Activity to the north and west is moving slowly to the west with some development to the south. At the same time, the echoes near and south of our location are moving

SSW. We will be leaving station at 1630 UTC so that the rib can be launched to take a crew member to the Kwajalein Hospital. Nothing serious, just an injured leg that won't heal. CRA

1710 UTC Ship is now underway to Kwaj. We left at approximately 1650, just after the 18Z sounding launch. This will be a good test for the INU. So far, it appears that it is following well. The loops show the overlays shifting southward as we head north. As for the sounding, although we have almost all available satellites, we have yet to receive any wind data. CRA

1840 UTC We have arrived at outer Kwaj. There is a lot of echo in the screen. Nothing is really organized, but there are clusters of cells. Each cell is about 30 km wide, Reflectivities are 45-50 dBZ. It looks like more widespread trade-wind showers – more than usual. PK

1848 UTC – We turned off the radar so not to interfere with Kwaj radars. PK

1920 UTC – The RIB was ashore. We turned around and left Kwaj.

2000 UTC – We turned on the radar and began scanning again. There are large areas of convection within the 150 km radar range. The systems are becoming more organized. All the echo is more or less orientated in N-S bands but remain pretty loosely organized. We see no stratiform signatures in the display. There is a lot of echo in the Eastern DD lobe. Tops look like they are approaching 13 km. Max dBZ are in the range of 45-50 dBZ. I would say about 25-30 % of the display is covered by echo. The 13 km top is NOT overshooting the tops in the eastern DD lobe. It looks like the most active day so far. PK

2050 UTC – talked to ops center. Aircraft going to fly starting around 0950 UTC. Kwaj radar having problems with their low level tilt (0.4 deg) and have taken that out of their task scheduler. They have requested us to stand by in case the RHB radar data is needed as a backup for vectoring aircraft (rc)

2100 UTC – on-station. Created tops product for 13kmb so we can keep updated as needed. Extensive region of precipitation in the east DD lobe with little apparent organization. Th precip also extends into the southern portion of the west DD lobe. Most of the precip in the lobes has tops near 10 km but there is an area near the baseline with tops to around 13 km (east lobe). We are not topping a lot of the echo in our immediate vicinity. Reflectivity maxs are 47-50 dB. Surface winds are out of the nw at about 8 kts. (rc)

2136 UTC Convair is airborne and will be passing over the ship shortly. The other two aircraft will depart within a half hour from Kwajalein. The Convair is taking a southern route into the convection near the ship and will possibly head back to the northeast after a few passes. No coordinates given for the flight tracks just yet. CRA

2140 UTC Some of the strong convection is slowly moving towards the ship from the north. Have not seen the Convair just yet, but still looking. The velocity products are showing an inbound wind maximum of around 10m/s. CRA

2150 UTC – Xsections did not show any BB in our vicinity. Impression is mostly convective cells strung out in linear patterns. Getting some good rain at ship now –50-70 mm/hr. Call from ops – all 3 aircraft are up and are flying N-S line in DD lobe. Setup rhi starting at 2200 UTC running around 60 deg az. Iris hung downstairs and had to be rebooted while doing xsection. General motion of convection is toward the sw (1 kts?) with individual cells moving s-se (rc)

2215 UTC planes finishing up on line approaching baseline in east DD lobe (rc)

2230 UTC Sounding just launched. Had a hard time just getting off the deck in such heavy rain. Rob just called to inform that the S-band profiler shows no signs of a bright band above us. Also, a well defined updraft is detected between 3 and 4km. CRA

2236 UTC Heavy rain all around the ship now. Rainrates on Imet as high as 105mm/hr. Just noticed that on the 2236UTC scan, strong attenuation throughout. Visibility is down to about 1/3 mile. Fog horn blasting away. CRA

2240 UTC Convair returning to Kwaj...radar problems. We are going to set up an RHI for 65 to 67. Other airplanes are still up. The next target for the aircraft is at [8.51N 168.06E, 8.16N 168.01E]. Visibility is now down to less than a quarter mile. CRA

2245 UTC Attenuation around the 100km range ring off to the west is estimate to be as high as 10-13dB down from the previous scans. Visibility down to only a few yards off the ship. CRA

2249 UTC The “trwlhs” rainrate sensor just had a reading of 320mm/hr. This is a questionable value. CRA

2300 UTC Approximately 50-60% of the scope is covered by echo now. Rain at the ship has diminished in intensity for the moment. The onboard gauges are reading rainrates around 50mm/hr. Still running RHI around 65 degrees az. Large area of rainfall with attenuated reflectivity as high as 40dBZ just to our south out of the DD lobes. The eastern most DD lobe is almost completely filled with echo. CRA

2311 UTC Surveillance scan was having trouble with resolving echo beyond the unambiguous range of 150km..In other words, RPHASE was not working properly. Suspect this may be due to heavy rain and attenuation (?). Made the following changes to surveillance scan only: Changed PRF to 500Hz, increased max range to 300km, and change processing from RPHASE to FFT. CRA

2314 UTC There is a dropped beam on the 2224UTC scan at an azimuth of approximately 165 degrees. Interesting to note that there was NOT a corresponding DSP angle error message with this as has been the case lately. CRA

2317 UTC Convair has landed. DC-8 has descended to 20kft and is preparing to move to the eastern line in the eastern DD lobe. TRMM ops is considering this data set for dual doppler comparisons. CRA

2333UTC Bright band appearing in the higher elevation scans. It appears to be approx. 4-4.5km up. Also, echo near the profiler on Legan showing tops of 12-13km in height. DC-8 and Citation are investigating the line echo in the eastern lobe (over the east buoy at 2348UTC). Both aircraft will travel to the western lobe to check out a line echo forming over the west buoy (2348UTC). DM

2355 UTC – The radar is starting to show a nice bright band developing over us. The aircraft are still sampling in the eastern lobe near the east buoy. We have light rain over the ship (4 mm/hr).

Thursday, 12 August 1999

Changing tapes

Tapes changed:

RB1990811 : 0000 UTC 11 August 1999 – 2358 UTC 11 August 1999 : 343 Files : No Problems

RB2990811 : 0000 UTC 11 August 1999 – 2358 UTC 11 August 1999 : 343 Files : No Problems

PK

0010 UTC – TRMM OPS called. The aircraft are to our SW at the location of 8.22 N, 167.51 E. The RHI is scan is being taking at 61 deg. PK

0030 UTC – surveillance scans show that this MCS is generally moving s-sw. Most of the active convection is just sw of the RHB location, with a rather large swath of stratiform precip in its wake. The MCS has rough dimensions of ~150 km in length (nw-se) and 300 km in width. Echo tops to the sw push up to 12-13 km but are mostly 9-10 km throughout the much of the rest of the domain. Velocity display shows nice e-ne jet just off the surface with winds in excess of 13 m/s – looks like a nice rear inflow jet. Some circulation off to the w-sw around 1 km elevation – very small scale features (making gif image) (rc)

0050 UTC – aircraft to be landing in about 20 minutes or so. May go back up for another flight later this afternoon. Sband profiler shows updraft near the melting level with fall speed increase below that height. (rc).

0104 UTC – dsp angle error – RTD appeared to show the 183 and 130 az rays being switched (these are the rays in the error message) – need to check the volume in RSL to see if that really occurs (rc)

0130 UTC – took out the rhi scan as system seems to be rapidly dissipating. Also, have been modifying SQI on surv. Scan since it looks pretty noisy. Bumped it up to 0.65 with no change. Decided to change bin spacing down to 1km to see if that helps average noise (SQI down to 0.45 and log at 0.8). Making gif images of PPIs and tops products - rc

0140 UTC Should say something about soundings – since 05Z yesterday, profile has moistened up considerably. Still nice bright band ring over us (rc)

0205 UTC – The convection continues to dissipate and become stratiform. We have a very interesting Doppler velocity pattern. We have weak westerly winds at the surface. Just above the surface, we have a strong easterly jet in the low levels. Speed max is about 15 m/s. At the upper levels, winds back to the NW and then finally switch more SW at the very upper part of the echo. We still have light stratiform rain at the ship. Max reflectivities have been decreasing to the mid-40's PK

0240 UTC The echo continues to decrease in area and intensity. The center of mass of the echo continues to move westward out of our region. PK

0330 UTC – system moving off to the sw and dissipating. Still a nice BB ring over us (rc)

0400 UTC – we are moving back up toward Kwaj to pick up the RHIB (rc)

0555 UTC – The system that was over us most of the day has moved west outside the 200 km range. It looks mostly stratiform with some embedded convection. There is some scattered convection developing towards the NE at about 200 km. It remains mostly isolated trade wind showers similar to what we have been seeing before. PK

0640 UTC – The western system continues to move westward. The echo to the NE at 200 km shows signs of weakening. We are starting a drift and reposition strategy with the ship because the N winds and E current are too strong to keep the ship on station. The skies remain overcast at the ship, which is probably remnants of the system from earlier in the day. PK.

0936 UTC – The system to the west has finally dissipated. The echo to the NE has not moved any closer than 200 km. It doesn't seem to be changing much in size and intensity at the moment. A weak stratiform signature is seen above us in the upper tilts. Otherwise, pretty quiet at the moment. PK

1716 UTC Small line of light showers aligned east to west across both DD lobes right now. It has been a very quiet night to follow up yesterday's excitement. CRA

1825 UTC – We are almost back to svr clr. There is some weak echo that remains from the system to the NE. A few, very weak cells exist in the West DD lobe. Otherwise, there is no echo within the range of the radar at the moment. PK

1940 UTC – Nothing to write home about. PK

2120 UTC – A few small cells exist in the western sectors. Otherwise nothing else to look at. Sky observations show scattered fair weather cumulus and mid-level altostratus, but mostly sunny skies are at hand on the ship. PK

2240 UTC – What little convection that we had earlier has disappeared. The shallow cumulus around the ship has also decreased in coverage. Nowcast: Mostly fine in the Central Pacific. PK

Friday 13 Aug 1999

0008UTC Tape changes

RB1990812 : 0000 UTC 12 August 1999 – 2358 UTC 12 August 1999 : 367 Files : No Problems

RB2990812 : 0000 UTC 12 August 1999 – 2358 UTC 12 August 1999 : 367 Files : No Problems

DM

0700 – light rain at ship from passing congestus (rc)

1240 UTC Both DD lobes are devoid of echo. Had a small shower pass over the ship around 1030, but dry since. CRA

1815 UTC – few scattered echos moving w-sw through the lobes. Tops less than 6-7 km. Surface winds out of ne at 13 kts (rc)

1830 UTC – A few echoes are scattered about the region. Maximum size of these cells is about 20 km. They are moving the WSW. Maximum reflectivities range in the area of 40 dBZ. They look like very scattered trade wind showers. They don't seem to have much of a lifetime. Sky observations show scattered cumulus and thin, upper level cirrus. PK

1930 UTC – Most of the trade wind showers have moved to our western sectors. Very little exists in the eastern sectors. There are nice trade wind showers around the ship at the moment. PK

2000 UTC – Wind has picked and most of the echo has moved off to the west or dissipated. Surface winds are now 16 kts from 65 deg. A lot more sea clutter is showing up from the increased wind speed. PK

2210 UTC – The few echoes that exist continue to move off to the west. The surface wind speed has continued to increase to about 20 kts sustained with gusts 22-24 kts. Because of the increased wind speed, we have gone on drift/reposition mode. PK

2300 UTC – Stopping scans to do a zauto. Zauto looks good. PK

2324 UTC – We are turning and burning holes through the clear air. PK

Saturday, 14 August 1999

0008UTC Tape changes

RB1990813 : 0000 UTC 13 August 1999 – 2358 UTC 13 August 1999 : 354 Files : No Problems

RB2990813 : 0000 UTC 13 August 1999 – 2358 UTC 13 August 1999 : 354 Files : No Problems

DM

0012-0036 UTC – Shutdown to change tapes and restart IRIS with new process id priorities. No echo to speak of anyway PK

0340 UTC Activity is really suppressed in the region. There is a few very tiny cells at the far reaches to the north. Surface winds have diminished to around 12 kts and have switched direction to more SE. PK

0650 UTC scattered cells – nothing in the DD lobes (rc)

1250 UTC Still limited activity on the radar scope. Some weak showers moving across in the southern half of the surveillance scan. Nothing in the ‘lobes’ thus far tonight. CRA

1558 UTC There’s a bit of stronger activity to the south than we’re used to seeing tonight. It’s still not too big, but it is about 20 x 10 km or so. The echos aren’t too strong, and they aren’t anywhere near the DD lobes.

1824 UTC – It looks like a system to our east at a range of 300 km had tried to move toward us since about 1600 UTC. At this time is located about 150 – 200 km to our ESE. It has started to dissipate rapidly in the last half hour. The maximum size of the system was about 100 km wide. It was not very organized as it propagated westward. It was not much to talk about, but it is better than sea clutter and clear air. The anvil from this system is seen to the east in the increasing light of sunrise. PK

2030 UTC – There is small but relatively strong echo to our SE at about 140 km. It has maximum reflectivity in the mid 40’s. Echo top height range to about 8 km. Echo size is about 75 km long and 20 km wide and is orientated N-S. Otherwise, there are few very small trade wind showers scattered about. I figured out how to create rainmaps. You

need to create an equidistant projection map which is centered AND reference to a point close to the radar. Therefore, all rain accumulations will be sent to a fixed grid. This projection is needed in the cappi's which are fed into the rain1 product generation. It really works now. I have started making hourly rain products starting at 19 UTC. I will also make daily accumulations for our log. PK

2200 UTC – the aggregate of the se is about 100 km distant now. At 21 Z, saw a pixel or 2 to 53 dB with tops to 9-10 km but it seems to be decaying now. Several cell aggregates moving well off to our south (150-200 km distant) and we are still seeing remnants of some decaying convection 200-300 km off to the ne. Couple of small cells in the lobes now. Time loop is showing groups of cells about 50-75 km distant to the east forming small (< 30 km) lines oriented n-s that are moving west. As we've seen in the past, there appears to be wavelength of 20-30 km spacing between the lines (making an image now). Surface winds are 6kts out of the ne. A little more congestus and cirrus in the sky compared to yesterday (rc)

2220 UTC A view of the surveillance scan shows that there are several areas of convection mentioned in the earlier entry to our S and SE. There is an area of dying convection around 200-300 km to the NE. Still pretty quiet in the area. PK

2340 UTC citation and convair(?) are flying some cells just south south west and east of us along a line (8 deg 21min, 167deg, 40min) (8 deg 27 min?, 168 deg 48 min) – transmission very garbled. Overpass at 0022 UTC. Cells are just south of the swath at this time. Turned on rhi to 109 deg az to catch cell convection in this region as suggested by trmm ops- this will hit cell at southern margin of east lobe. Made an image of 2336 ppi for reference. Flight line appears to be just s and on fringe of east of DD lobe. Tops along this line at 2336 are everywhere below 8 km and highest reflectivity is 43 dB (rc)

Sunday, 15 August 1999

0005 UTC – TRMM Ops called. They would like us to scan RHI's at 166 deg. They are also interested in doing inter-comparison of radars as it presents itself. PK

0009UTC – Tape changes

RB1990814 : 0000 UTC 14 August 1999 – 2359 UTC 14 August 1999 : 356 Files : No Problems

RB2990814 : 0000 UTC 14 August 1999 – 2359 UTC 14 August 1999 : 356 Files : No Problems

DM

0019 UTC – Light rain shower at the ship. PK

0030 UTC – TRMM OPS called. We switched the RHI to 170 deg and will follow the cell accordingly. They mentioned that the planes will probably land after the overpass,

which occurred at 0022 UTC. The conditions are favorable for active conditions later this evening – MCC type convection. PK

0040 UTC – I started a 6 and 24 hr rainfall accumulation product along with the hourly rainfall product. The system that the planes are working has max reflectivities in the low 40's and max top to 9-10 km. It continues to move westward. I have set the RHI's to scan over the 175 and 177 azimuths. Rain has ended at the ship PK

0050 UTC – More echo is starting to develop off to our east between 50 and 100 km. Currently, the cells are small, but are starting to become organized. They are orientated more N-S than E-W. There is also convection developing beyond 150 km to our SW. PK

0110 UTC – The system to our south that we were doing RHI's through is starting to dissipate. I think this will be the last set of RHI's for awhile. No new development in the last 20 min. PK.

0410 UTC – An area of convection has developed to our SW between 75 and 150 km. It is showing signs of becoming organized. It is about 150 km long and 50 km wide. Max dBZ values are around 50. No stratiform is seen but the individual cells are organizing into one mass as time progresses. Echo tops are about 10-11 km. PK

0440 UTC – a group of cells have formed a loosely organized line (almost a bow shape) oriented n-s (e-w portion on the northern perimeter). The southern portion extends into the east DD lobe. Max dBZ's are in the low 40's. Tops of one cell in n. portion of east lobe is near 11 km – other tops are below 8km (rc).

0530 UTC – The group of cells to the ne has not maintained a coherent line structure. However, the time loop indicates that outflow from this group on the southern flank has collided with some kind of boundary emanating from a small group of cells near the east buoy to form another group of cells just to the ne of the ship. Several nice CB's here with pelius clouds on some of the turrets. Time loop shows that cells within the convective mass to our sw (> 100 km) are moving se while the aggregate moves slowly westward. I suspect lack of coherent mesoscale structures are due to the weak steering winds (rc)

0610 UTC – Convection continues to become more active with time. There are two main areas of activity. One area is located to the NE from 25 km out to 300 km. The other area is located to our SW. It contains an area of solid convection that is about 50 km x 50 km. It has an extensive area of reflectivity above 30 dBZ. Between the two areas of convection, centered on us, we have small NE-SW line of convection forming. Some of these lines are pretty intense, cores in the upper 40's. We have one just to the NE of us at a range of 10 km. There is a nice shelf cloud and low hanging scud associated with the rain shaft. It looks like it could get active this evening. PK

0645 UTC – We have a nice line forming in the eastern section of the eastern DD lobe. There is a nice convective cell directory north of us. The line is N-S orientated and is moving westward. The line formed by several isolated cells merging together to form a line. Maximum reflectivities are around 50 dBZ. Surface winds are out of the SE at 8 kts. Another area of convection is forming in the Western DD lobe. Smaller, scattered convection is also starting to form in the surrounding regions. Echo top heights are only 7-8 km. PK

0648 UTC – A convective is moving over the profilers and disdrometers on Legan. The storm to our NNE is just off the port bow by about 8 km. The gust front is pushing us off station to our S. PK

0700 UTC – The convective core is directly over Legan. Max reflectivity over Legan is 42.5 dBZ. PK

0725 UTC – The line to our east continues to develop and move west. It is now located over the East Buoy. It is about 150 km in length and 30 km wide. The convective cell directly to our north is about to hit us. The cell is showing signs of weakening at this time. The convection in the west DD lobe is starting to organize. A thin W-E line of convection is forming across the center of the DD lobe over the West Buoy (how often does two buoys get hit at once?). The height and intensity characteristics are about the same as before. The CO brought a satellite image up and it looks like a major disturbance is about to move through the Kwajalein area. The rain over Legan looks like it has just about dissipated. PK

0800 UTC – A NW-SE line is forming on the north side of the cell the died over us. It looks like it could be the result of convergence from the outflow of the cell. It has merged with the N-S line to our east. There is still rain occurring over the two buoys. Scattered convection is starting to develop and dissipate in all quadrants. The planes WILL not be flying in the dark. Too bad, because it looks like a active night. Rob made a gif image from this time for reference. The tops products show that the cell to the east in the DD lobe (Dave says its 50 km due East) is reaching an echo top height exceeding 13 km. PK

0853UTC--- Cell to the north of the ship (35km) and just south of Kwajalein increasing in reflectivity (slightly) to 45dBZ-50dBZ with tops building to 12km. However, part of the echo is obscured due to the cone of silence, which has extended out to 30km or so. Not too much movement with this cell, due to light winds. DM

0900UTC--- Cell 55km ENE of the ship (within dual doppler lobe) is increasing rapidly in tops to 13km. Reflectivities exceed 50dBZ (must look verrrrry closely). DM

0917UTC--- Line of convection (N-S orientation) to the east is expanding in size rapidly. The area of convection with tops greater than 10km is increasing as well. DM

1000UTC Significant increase in intensity on the approaching line. The movement is slow; westward around 5kt. It will be awhile before it gets here. No lightning has been seen, but I expect that there will be some before this is all over. CRA

1006UTC--- Line echo to the east continues to grow in intensity, echo tops, and area. Reflectivities visibly over 50dBZ, and two large cores in the tops images over 13km in height. Line continues to move at a very slow rate. Winds outside are out of the northeast at 9-10kts. Line of convection is moving slowly eastward. Lightning detected by Cathy approximately northeast of the ship. DM

1112UTC--- Echo tops maxed out at 10pm, although there is still a large region of echo still showing tops greater than 10km. Reflectivities are still 35-45dBZ. Overall there seems to be a slight decrease in intensity, but echo coverage still remains strong. Radial velocities over the past hour show a few short lived meso-lows, but nothing too strong or exciting for that matter. DM

1230UTC The eastern lobe has been completely filled with echo for the past 30 minutes or so. Too bad there are no flights scheduled for tonight. What was a well-developed line of convection has evolved into a large area of mostly stratiform rainfall. CRA

1322 UTC Eastern lobe is still mostly filled with echo. Storm is large; it extends about 100 km south, east and west of the ship. The only quadrant of the 100km circle surrounding the ship is the northwest quad.

1508 UTC The storm has mostly moved out of the first 50 km radius circle from the ship, and is between that and the 150 km circle. There appears to be some echo coming from the extreme northeast, but not very intense. Most of the echo left in the eastern lobe is very weak. The western lobe has very few echos in it still.

1750 UTC – echo continues to move south and dissipate. Surface winds are out of the south-sw at 11kts (rc).

1843 UTC – The mysterious 1 day jump in time for the PPI product for vol A of the 13 km happened again. It went to 1200 UTC 16 August. I deleted the two PPI files from product output and restarted the PPI product generation in the product scheduler. Most of the activity during the nighttime hours has dissipated. There is some weak stratiform echo about 100 km and beyond to our south. Surface winds have picked up to 17 kts out of the SSW. PK

1936 UTC – Most of the echo within in the 150 km range of the radar has dissipated at this time. Some very weak stratiform echo exists at the farthest ranges to the south. Another quiet day? PK

2024 UTC – Almost all the echo has dissipated. Only scattered altocumulus and cirrus remain over the ship. The surface wind has decreased to 7 kt out of the S. PK

2330 UTC – you really can't get more severe clear than this – there is nothing other than sea clutter on the screen. Sky has few cu humilis, alto stratus and cirrus and plenty of blue sky (rc)

Monday, 16 August 1999

0000 UTC Severe Clear.

Tape change

Tapes changed:

RB1990815 : 0000 UTC 15 Aug 1999 – 2358 UTC 15 Aug 1999 : 366 files: No Problems

RB2990815 : 0000 UTC 15 Aug 1999 – 2358 UTC 15 Aug 1999 : 366 files: No Problems

0020 UTC – Stopped for zauto and check of antenna PK

0100 UTC – Back scanning. Everything checks out fine. Not a single echo. We are going attempt a sphere cal at 0300 UTC. PK

0258 UTC – stopped scan tasks for sphere cal (rc)

0304 UTC – start running task “sphere track” (0.25 deg el limits 31 angles, 128 samples, 125m gate spacing) distance is 3.2 nm– rc

0315 UTC – balloon appears to be up – return showing up on display (rc)

0327 – good paint on the target - we are topping the balloon within 1.25 deg -rc

0344 UTC – largest reflectivity so far as can be determined from real time display –rc

0352 UTC – running nathan's sphere track2 – good return at 0354 UTC

0410 UTC – back on regular task schedule –rc

0415 UTC – stopped scanning. Raw sphere products not being archived because we did not have “RB1” selected on the request line of the product output. These raw products got sent to tape (both exabytes) after the 0412 (13kMA) vol. Also, /home/operator disk was full due to .ps files in the /usr/operator directory. Moved these to /tmp. Copied raw sphere iris files from /usr/iris_data/product_raw to “case” subdirectory – rc

0446 UTC – back on schedule once again (rc)

0600 UTC – There is some scattered convection to our East, but it is showing signs of weakening at this time. PK

0915 UTC – an east west oriented band of convection is drifting west-nw just north of the east DD lobe. Several of the cells along this line have tops in excess of 13 km. The line extends about 100 km. Max reflectivities are < 45 dB. No lightning reported so far. A few scattered cells in other quadrants but nothing organized on the mesoscale. (rc)

1213UTC--- spotty convection with no real development to our east and northeast. Cells that do form seem to be dying quickly. DM

1433 UTC Not much activity at all. There are some small cells all around, with one large two larger ones to the northeast, and a small line of convection to the southwest.

1455 UTC It seems that we are lacking middle and/or upper level support for any of these storms. They remain very isolated and shortlived. None of them appear to have very strong cores either. CRA

1820 UTC – All equipment seems to be working well. There is little or no echo to be seen. From the movie loop, it looks like it has been quiet all night. Svr Clear in the tropical middle Pacific. PK

2210 UTC – No significant echo in the region, but mostly clear. We are scheduled for a aircraft flyby at 2235 UTC. For safety, we are shutting down the radar at 2224 UTC. PK

2250 UTC – The citation made 3 passes on the starboard side about 500 ft ASL and about 1 mile out from us. The DC-8 was directly overhead on the last pass. At 2245 UTC, they headed towards Meck. PK

2300 UTC – Turning and burning clear air. PK

Tuesday 17 Aug 1999

0005UTC--- tapes changed

RB1990816 : 0000 UTC 16 Aug 1999 – 2358 UTC 16 Aug 1999 : 338 files: No Problems

RB2990816 : 0000 UTC 16 Aug 1999 – 2358 UTC 16 Aug 1999 : 338 files: No Problems

DM

04 UTC

I stopped scanning with the radar to work on optimizing the rph surveillance scan. I changed the Whitening filter parameters under the Modify Filter(Mf):

	OLD	NEW
Noise threshold for replacing a point:	1.2	3.0
Replacement value multiplier:	0.0	0.5

Modify Processing(Mp)

Window: User Blackman

I also changed CSR in task config. From 22 to 30dB.

I am running the original scan(surveillance) and my tweaked RPH surveillance scan(surv2) back-to-back for a couple of hours to compare them. This will not affect normal data collection. (NG)

0540 UTC- just a few scattered cells in all quads - otherwise a blank screen. surface winds are out of the east at 11 kts (rc)

0740 UTC – scattered cells (rc)

1655 UTC Numerous small cells around. It is presently raining on the ship, but it appears that most of the sky is full of stars. All the activity is moving along from East to West as usual. Rainrates around 2mm/hr. Overall, nothing to get excited about. CRA

1725 UTC – It looks like things are becoming more activity during the past few hours. Numerous but very small trade wind showers are developing in all quadrants. The convection remains pretty scattered and unorganized. There are a few small lines forming but mostly all echo is small convective cells. It could be just the nighttime maximum of precip that is seen in this region. A couple of small cells are in the DD lobes. PK

1920 UTC – still scattered cells and small (< 30 km) lines moving west through domain. Most of this is concentrated to our south, outside the DD lobes. This area has a couple of zonal oriented bands spaced (40-50 km apart in meridional direction. Tops on activity to our south are generally 7-9 km (one cell over Namu with tops to 11 km). Cells in the DD lobes are generally below 8 km and are widely scattered – no linear organization yet. Reflectivity values range up to 48 dBZ. Suspect activity is associated with weak disturbance moving through area as described in ops forecast discussion. Winds are out of the east at 11 kts (rc)

1935 UTC – call from TRMM ops. DC8 just took off to fly small aggregate (band?) of cells about 80 km se of us over Namu. Started RHI's at 135 deg (1944 UTC). Citation will take off at 20 UTC. Cells at north end of Namu appear more active than what the aircraft are currently planning to target. Made gifs off ppi and tops (rc).

2000 UTC – citation just tookoff. Aircraft are probably going to fly that aggregate west of Namu. Tops there are 12-13 km (low level reflectivities of 43 dBZ). We changed the RH to bearing 155 deg. Leading cell farther to the west in that same band has dBZ's of 48. Convair is down today (rc) –

2015 UTC – coordinates that citation will fly: 167 57 – 167 37 lon - this is the western cell along the line with higher dBZ's (47) and lower echo tops (7-8km) at 2000 UTC- (rc)

2024 UTC – changed RHI to bearing 208-210. Leading cell on west end at this bearing has reflectivities to 53 dBZ and tops to 11-12 km. It's about the most exciting cell on the display. There are a couple of isolated and aggregate cells in the east lobe – one has tops to 11 km (rc)

2036 UTC – error message “tops product RHB13B_tops from a prior run has been stopped”?

2050 UTC – moved rhi over to 220 bearing. Paul did a couple of x-section downstairs without hanging the machine (turned off all loops). At 2036, the cell at bearing 220 (50 km distant) has a nice vertically well developed core with 30 dBZ to 8 km – tops above 13 km - making gif of the xsection. Can see the anvil remnants toward us (ne of cell). Also nice little cell-line over the east buoy at this time (rc)

2105 UTC – ops center says that aircraft are moving off to aggregate cells /quasi line about 100 km se of us at bearing 120 deg – setup RHI for 125 deg. Cell tops are 11-12 km (rc)

2148 UTC – I changed the RHI az to transect through the cell at az of 168-170 deg. PK

2250 UTC – The DC8 is still working a cell to the south of us at a az of 170 and range of 50 km. It is not a large but better than nothing. They are going to move over to a small line of convection located to our sw between 40 and 100 km and is orientated NE-SW. There is other echo scattered about the region but nothing is too organized. PK

2310 UTC – The DC 8 flying a unorganized line directly east of us from 50 to 150 km. They are flying one leg and then going in for the day. There is a pretty intense cell to our SW but otherwise just scattered convection. Tops in these cells are about 10-11 km and max reflectivities in the mid 40's. PK

Wednesday 18 Aug 1999

0005UTC--- tapes changed

RB1990817 : 0000 UTC 17 Aug 1999 – 2358 UTC 17 Aug 1999 : 365 files: No Problems

RB2990817 : 0000 UTC 17 Aug 1999 – 2358 UTC 17 Aug 1999 : 365 files: No Problems

0010UTC--- tape drives cleaned
DM

0120 UTC – echo moving through the DD lobes over the last hour or so. Time loop shows that a group of cells stretching across the sw portion of the west lobe to the ne portion of east lobe appears to be moving as a unit, although the “line” is broken in several portions. Some complicated outflow interactions on the nw side, just s. of Kwaj. Appears to be decaying remnants that interacted with this group of cells, firing off

another group of cells a bit farther to the west. Highest reflectivities appear to be about 48 dBZ. Echo heights are generally < 10 km although cell due west of us (40 km range) has tops to 12-13 km. We are not topping a significant amount of echo near us in the west DD lobe (rc)

0215 UTC – The citation is about to begin another mission. They are going to start flying the system in the West lobe. There is a loosely organized line that extends NE-SW to the north of us. It is about 100 km long. The most intense cells are south and west of the west buoy. Max dbz's are in the upper 40's. Echo top heights in this system are about 12 km in the cell farthest to the west.

0222 UTC – Started RHI's at az of 270 and 272 through the moderate cell to the west. PK

0243 UTC – The line that the citation is flying is starting to fall apart into isolated convective cells. Most of the intense cells are located in the western DD lobe with the most intense cell located on the western edge of the lobe. Echo is slowly moving WNW. Max echo top heights remain around 11-12 km PK

0255 UTC – call from ops center. Citation now flying cells just west of Kwaj (bearing 310 and 340 deg) from RHB. Tops on these guys are 8-10 km as of 0248Z. Switching RHI to 340 deg. Time loop shows that most activity in region, including target cells, is dissipating (rc).

0315 UTC – Stopped RHI as convection is dissipating (rc)

0720 UTC – A few scattered areas of convection around the area. One small cell exists in the Eastern DD lobe. It looks about the same as it has for the entire day. PK

0800 UTC – Few scattered echoes. Not much has changed! PK

1405 UTC Still the same. Just a few scattered echos. Nothing much.

1745 UTC – a small (~50 km) band approaching the west DD lobe from the south east. The band is oriented ne-sw. Tops are below 8-9 km and the highest reflectivities are less than 43 dB. Time loop shows that the most vigorous region is along the sw part of the line, but overall, the line appears to be fading now. Some scattered cells in other parts of the domain. Surface winds are out of the south east at 9 kts (rc).

1842 UTC – The sun has risen one last time for this cruise. PK

1900 UTC – A few isolated trade wind showers exist. They have decreased in size and number during the past hour. One small cell remains in the western DD lobe. Another quiet day? Ops center called. No aircraft operations today. PK

2200 UTC – scattered cells and small bands moving nw across the domain (rc)

2350 UTC – There is a small line of convection to our SE at a range of 25 km. Otherwise, there is just an isolated convective cell around the area. Mostly fine in the tropics. PK

Thursday, 19 August 1999

RB1990818 : 0000 UTC 18 August – 2358 UTC 18 August 1999 : 365 files : No Problems.

RB2990818 : 0000 UTC 18 August – 2358 UTC 18 August 1999 : 365 files : No Problems.

Changed tapes and kept on turning and burning PK

0400hrs I brought the radar down for about half an hour to do a suntrack and a zauto. (NG)

0630 UTC – more of the same: scattered trade wind showers. Isolated with little in the way of organization (rc).

0700 UTC – Occasional trade wind showers. A few and far between at this time. PK

1200 UTC – We made the call. Only a few echoes were scattered throughout the region. Shut down the radar to begin final archiving. We are no longer turning or burning! PK

Tapes archived:

RB1990819 : 0000 UTC 19 Aug 1999 – 1159 UTC 19 August 1999 : 172 Files : No Problems

RB2990819 : 0000 UTC 19 Aug 1999 – 1159 UTC 19 August 1999 : 172 Files : No Problems